

EDIBLE WOOD FERN ROOTSTOCKS OF WESTERN NORTH AMERICA: SOLVING AN ETHNOBOTANICAL PUZZLE

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ABSTRACT.—Many ethnographic reports refer to a large, “pineapple-like” fern rootstock which was an important native root vegetable in northwestern North America. It is suggested here that the primary, most commonly used edible type is *Dryopteris expansa*, with other, related species having been used in some localities and under some circumstances. The rootstocks were cooked in pits, often in winter when food was scarce. They are seldom eaten today and are known primarily by native elders. Several botanical identifications for this food have been suggested in *Dryopteris*, *Athyrium*, and other fern genera. Species verification has been complicated by lack of botanical expertise among early reporters, difficulty in recalling the fern characters by elders, and taxonomic complexities of the ferns. Rootstocks of *D. expansa* were harvested by the Nuxalk at Bella Coola, cooked, and prepared for nutrient analyses. Proximate composition and energy are similar to that of the common potato, but Ca, Mg, Zn, Cu, and Mn were present in levels several-fold higher than that of potato.

RESUMEN.—Varios informes etnográficos se refieren a un rizoma grande, “semejante a una piña,” de un helecho, que era una importante raíz alimenticia nativa en el noroeste de Norteamérica. Se sugiere aquí que el tipo comestible primario, más comunmente usado, es *Dryopteris expansa*, habiéndose empleado otras especies emparentadas en algunas localidades y en ciertas circunstancias. Los rizomas se cocían en cavidades en el suelo, con frecuencia en el invierno cuando escaseaba la comida. En la actualidad se comen muy poco, y son principalmente los ancianos indígenas quienes los conocen. Para este alimento se han sugerido varias identificaciones botánicas en *Dryopteris*, *Athyrium* y otros géneros de helechos. La verificación de la especie se ha complicado por la falta de pericia botánica entre los primeros observadores, la dificultad en recordar las características de los

helechos por parte de los ancianos, y la complejidad taxonómica de los helechos. Colaboradores Nuxalk cosecharon rizomas de *D. expansa* en Bella Coola, que se cocieron y prepararon para análisis nutricional. Los análisis bromatológicos básicos arrojaron resultados similares a los de la papa común, incluyendo su valor energético, pero se encontraron niveles de calcio, magnesio, cinc, cobre, y manganeso varias veces más altos que los de la papa.

RESUME.—De nombreux rapports ethnographiques font référence à de grosses racines de fougère, semblables à un ananas, qui étaient un important légume local en Amérique du Nord. L'hypothèse est émise que le type comestible primaire et le plus utilisé est la *Dryopteris expansa* alors que d'autres espèces proches étaient utilisées dans certaines localités et dans certaines circonstances. Les racines étaient cuites dans des trous, souvent en hiver, lorsque la nourriture se faisait rare. Elles sont rarement consommées aujourd'hui et sont surtout connues des personnes âgées. Différentes identifications botaniques pour cet aliment ont été suggérées dans *Dryopteris*, *Athyrium* et d'autres genres de fougères. La vérification botanique a été rendue difficile par le manque d'expertise botanique des premières sources, par la mauvaise mémoire des anciens à propos des caractéristiques des fougères, et par leur complexité taxonomique. Les racines de *D. expansa* furent recoltées par les Nuxalk à Bella Coola, cuites et préparées pour être analysées. La composition "proximate" et l'énergie sont similaires à celles de la pomme de terre commune mais le Ca, Mg, Zn, Cu, et Mn y sont présents en plus grande quantité.

INTRODUCTION

Ferns are an important component of northwestern North American flora. The moist, mild coastal climate is ideal for the growth of many Pteridophyte species, and the diversity of habitats and microclimates is reflected in the diversity of species of ferns. Many reports have been published concerning the edibility of certain ferns by native peoples of the region (cf. Gunther 1973; Turner 1975). The use of the rhizomes of western bracken fern (*Pteridium aquilinum* (L.) Kuhn) as food by Northwest Coast peoples has been well documented (cf. Norton 1979). The rhizomes of licorice fern (*Polypodium glycyrrhiza* D.C. Eat.) are also well known, even today, as a mouth sweetener and appetizer, although they were seldom eaten in any quantity (cf. Turner and Bell 1973; Turner 1973, 1975).

Perhaps the most intriguing and puzzling "fern food" is the rootstock recalled by many contemporary native elders and widely cited in the literature as a large, "pineapple-like," or "banana-like" clump of "fingers" which was cooked and eaten traditionally, both as a regular part of the diet and as emergency rations, along the coast from Oregon to Alaska and inland in British Columbia. There is probably more confusion about the identity of this edible fern rootstock, hereinafter called wood fern in a general context, than about any other traditional food plant in northwestern North America.

One of the earliest literature references to edible wood fern is by Gorman (1896), who identified it as *Dryopteris spinulosa* [*Aspidium spinulosum* var. *dilatatum* (Wood-fern)] and provided the following account of its use by the Coast Tsimshian of southeastern Alaska (Gorman 1896:78-79):

[Wood-fern] . . . is abundant in rich open woods near sea level, and the rootstock or caudex is highly relished by the natives, who cook and eat it in large quantities, it being the first vegetable food which they obtain in early spring. [It] . . . is called "Ahh," by the Tsimsians, who inform me that it is larger, sweeter, and of better flavor when grown under or in the vicinity of salmon berry bushes . . .

Ethnographers without botanical knowledge described the fern in the most general of terms. For example, J.P. Harrington, in his unpublished ethnographic notes, referred to it under a Suquamish place name for a creek at Miller Bay ("Miller's Inlet") on the Port Madison Indian Reservation in Washington:

du ts'kweb Means:- *ts'akwe'* = root used to eat long ago. Grows in marshy place. Have heavy roots like a ball. Grass [Fronde] like feathers. 1 ft high. Black on surface & white inside. Grow up like fingers in bunches.¹

Barbara Lane (personal communication to NJT, 1984) described the same Suquamish fern in more detail, based on descriptions by Native people she consulted:

It [*ts'Ekwi*] is styled variously the "fossil fern," "evergreen fern," and "Indian banana." It is a tall plant, and grows on logs in damp places. A cluster of edible pods is found at the bottom of the stalks, looking like one's hands placed palm to palm. The Indians gathered these pods and baked them as they did clams, burying them in a pit with hot stones. The existence of these plants on the west side of the bay gave the place its name . . . Miller Bay used to be called Squaib Bay, clearly a rendering of the native term for the fern.

Edible wood fern rootstocks, all having more-or-less similar descriptions and methods of gathering and preparation, have been described and identified as *Dryopteris austriaca* (Turner 1975; Heller 1976; Oswald 1957), *D. filix-mas* (Turner 1973, 1975), *D. dilatata* (Kari 1987—"D. dilata," [sic]), *D. expansa* (cf. Lepofsky et al. 1985), *D. spinulosa* (Gorman 1896—"Aspidium spinulosum var. dilatatum;" Harlan Smith, unpublished notes, 1920-1921—"Aspidium spinulosum"), *Thelypteris limbosperma* (Norton 1981), *Cystopteris bulbifera* ("Ksan, People of 1980), *Athyrium filix-femina* (Kari 1987; Harlan Smith, unpublished notes, 1920-21—"Asplenium cyclosorum"), and *Polystichum munitum* (Turner 1975; Turner and Bell 1973; Nancy Turner unpublished notes on Haida, 1971).³ *D. spinulosa*, *D. dilatata*, *D. austriaca*, and *D. expansa* are considered to be in the same taxonomic complex, as explained later. In most, if not all cases, the identifications were made on the basis of selection and information provided by Native elders.

Potentially all of these species were used but, logically, some citations result from confused or mistaken identifications. In this paper, we present evidence to indicate that the "real" wood fern rootstock—the one normally used as food—

is that of *Dryopteris expansa*, but that on occasion other, similar types of fern rootstocks were also consumed.

The confusion surrounding the identification of the edible wood fern is exemplified in the unpublished notes of Harlan I. Smith on plant use by the Nuxalk (Bella Coola) and Carrier Indians of central British Columbia. Smith referred in several places to an edible fern called *sq'wâlm* ("squalum"), which had a ". . . part like a pineapple at the base [that was] used for food." In his Carrier ethnobotany notes, he identified it as *Athyrium filix-femina*⁴ and noted, "Leaves coarser and less bifurcated than the shield fern." In his Bella Coola ethnobotany notes, he identified *squalum* as *Dryopteris expansa*⁵ and also attributes the name "Xala" to this species. Then, he notes: "Trouble. Same species given two different Bellacoola names, one useful for food only, the other used for medicine." His native Bella Coola consultant evidently applied the two native terms to different specimens of the same species. Adding further confusion, a third term, "kamatz," was applied by Smith's Native consultants to the tops (fronds) of *Dryopteris expansa* (see previous footnote) and *Athyrium filix-femina*⁶ with a note under the latter: "Trouble. Joshua [Moody] calls this the same as Shield Fern 7 (54M) with which it was collected; yet that is the same species as 7 (77M) which he calls *squalum* [both of these are actually *Dryopteris expansa*]."

Elsewhere in his unpublished notes, Smith mentioned two other fern species which were sometimes mistaken for the real *squalum*. Under *Polystichum munitum*, sword fern, he noted: ". . . This plant was not used for food . . . but was [sometimes] mistaken . . . for another fern called *squalum*. The two forms were distinguished by the leaves as the banana-like parts appear the same and both are easy to pull up. The leaves of the sword fern . . . do not die in winter . . ." Under an unidentified fern "*See el i tana*,"⁷ he noted that this one was ". . . a little different from *squalum*. Sometimes people . . . mistake it for *squalum*. It is not good food. *Squalum* is [a good food] . . . Roots same and top same as *squalum*. I think *squalum* has no spores and *See el i tana* has." Smith's Carrier notes are equally confusing.⁸

As will be seen, research within the last two decades at Bella Coola has resulted in clarification of some of the confusion surrounding *sq'wâlm*, but the problems that faced Harlan Smith and the Native people he worked with seem to have been repeated in virtually every area where wood fern was eaten. Furthermore, plant taxonomists have also been confounded in the scientific classification of wood ferns, and the many synonyms and nomenclatural discrepancies for various *Dryopteris* species have made the problem of identification especially difficult.⁹

The aim of this paper is to resolve, as much as possible, the questions arising from the bewildering and sometimes conflicting array of botanical and ethnobotanical information on the edible wood fern in northwestern North America, and to document the traditional importance of this food in Native cultures. We will summarize the botanical and taxonomic features of the wood fern complex in northwestern North America, and relate the botanical characteristics to the utility of the plant. Then we will review the Native terminology, descriptions, and use of the edible wood fern, using information derived both from literature sources and from interviews with contemporary Native

consultants in various speech communities of the region. Nutrient data from specimens collected and prepared at Bella Coola are provided, as well as use frequency and taste appreciation data. Information on non-food uses and the importance of wood fern in mythology and traditional beliefs is also given.

BOTANICAL AND TAXONOMIC ASPECTS OF THE WOOD FERN PUZZLE

Narrowing down the species.—The fern species reported in this study to have edible, "pineapple-like" rootstocks fall into five genera. These are annotated and evaluated as follows (see also descriptions in Scoggan 1978 and Taylor and MacBryde 1977):

Cystopteris — *C. bulbifera* ('Ksan, People of 1980); does not occur in British Columbia (Scoggan 1978); concluded to be erroneous identification;

Thelypteris — *T. limbosperma* (Norton 1981); voucher specimen (613 WTU) examined by Adolf Ceska in 1989 and found to be *Athyrium filix-femina*;

Athyrium — only *A. filix-femina* (L.) Roth (lady fern) has rootstocks large enough and distribution wide enough to "qualify;" has been identified on occasion as the edible type (see previous entry), but usually rejected;

Polystichum — only *P. munitum* (Kaulf.) Presl (sword fern) has large enough rootstocks to be the edible type, and has occasionally been suggested as such in literature citations,¹⁰ *P. braunii* (Spenner) Fée (Braun's holly fern) has rootstocks large enough, but has never been cited in ethnobotanical or ethnographic literature as having been eaten;¹¹

Dryopteris — most frequently cited as having edible rootstocks; taxonomic treatments for the genus widely variable (cf. Hultén 1968; Calder and Taylor 1968; Scoggan 1978); some species ruled out because of size or range,¹² leaving *D. filix-mas* (L.) Schott (male fern) and two species of the "Dryopteris expansa complex:" *D. carthusiana* (Villars) H.P. Fuchs¹³ and *D. expansa* (K.B. Presl) Fraser-Jenkins and Jermy; (see Walker 1955, 1961; Britton 1962, 1968, 1972; and Widen and Britton 1971 for detailed discussions of the taxonomy of this complex).

Of the *Dryopteris* species mentioned, *D. filix-mas* was identified in one case (Turner 1973) but the *Dryopteris expansa* complex has been more consistently recognized. The two species from this complex are similar, but *D. carthusiana* (syn. *D. spinulosa* [O.F. Müller] Watt) has fronds with more or less parallel sides at their lower part and has a chromosome count of $2n = 164$, whereas *D. expansa* (syn. *D. assimilis* S. Walker, *D. dilatata* [Hoffm.] A. Gray var. *alpina* Moore) has fronds more or less triangular in outline, with a chromosome count of $2n = 82$. The latter is common in northwestern North America; the former is less frequent, but where it occurs, it may grow side by side with *D. expansa* (e.g., in Exchamsiks River Provincial Park in northern British Columbia). Of all the species mentioned, the one most frequently and consistently cited as THE edible wood fern of northwestern Indigenous Peoples, when synonymy is considered, is *Dryopteris expansa*.

Native perceptions.—Given the complex situation of so many, widely variable fern species and genera sharing at least some characteristics, it is not surprising that

Native people have often provided varying and confusing identifications and descriptions of the edible wood fern and others they consider to be related.

McIlwraith (1948, in his Appendix C), in discussing folk classification of the Nuxalk (Bella Coola) adds another perspective to the problem: "In regard to plants, a difficulty lies in the fact that Bella Coola nomenclature is not always strictly botanical. Two or more distinct ferns, for example, may be grouped together on account of their similar use as food and one name applied to them indiscriminantly ..." A Haida Native elder, the late George Young, stated the same concept in discussing several ferns given the same Haida names¹⁴: "One word can mean so many names. It's all in the way the sentence or the subject is brought up. You can have one word for two completely different kinds of plants . . ."

The close perceptual relationship among various ferns is shown in the Nuxalk area by the term *qaxmats*, mentioned previously in the introductory discussion of Harlan Smith's unpublished notes, which is sometimes applied to the fronds of *Athyrium*, *Dryopteris*, *Polystichum*, and *Pteridium*¹⁵ although the rhizomes are usually given different names. The identification of the true edible wood fern, *sq'wálm*, must be made from the appearance of the rootstock, not the aerial parts. Nuxalk elder Felicity Walkus once applied the name to specimens of both *Dryopteris expansa* and *Athyrium filix-femina* growing side by side¹⁶, but when she examined the rootstocks after they were dug up, she stated that only the *Dryopteris* was the true *sq'wálm*. This identification was confirmed by Margaret Siwallace and two other Nuxalk elders. The *Athyrium* rootstock, they said, was the one called *ǰala*, which was like that of the edible fern, but smaller, blacker, and covered with dark hairs. Grizzly bears are said to like to eat *ǰala*, but it makes them cranky (Nancy J. Turner, unpublished notes on Nuxalk, 1981). Margaret Siwallace later stated that there were four types of fern that were almost alike. The one with fleshy, round "fingers" (leaf bases) was *sq'wálm*, the "flat one," *ǰala*, was poisonous, and two other kinds are similar to *sq'wálm*, and edible, but not quite as good (Nancy J. Turner, unpublished notes on Nuxalk, 1983).

Lillooet consultants definitely excluded *Athyrium* as the edible wood fern, although one elder called it "a kind of" *c'ǰkwa?* (*Dryopteris*). Its big, black "roots" are said to be so tough that even a plough cannot go through them (Randy Bouchard, personal communication to NJT, 1974). One specimen collected with Lillooet elders and said to be the edible kind was identified as *D. carthusiana*¹⁷

In the Skeena drainage of northern British Columbia, a number of different identifications have been made of *aǰ*, the plant with edible rootstocks. *Athyrium filix-femina* and *Dryopteris filix-mas* plants in leaf were pointed out as *aǰ* by David Green, a knowledgeable Gitksan elder (Leslie M.J. Gottesfeld, unpublished notes, 1988).¹⁸ Later in the season, however, he identified *Dryopteris expansa* as *aǰ*, and excluded *Athyrium*. Another Gitksan consultant, Jeff Harris Sr. of Kispiox, who as a child had frequently collected edible fern rootstocks with his grandmother, pointed out that the edible type was recognized from the rootstock, rather than from the tops. The fern was sought and dug up after the fronds had withered. Ferns with a small rootstock, or ones with small or flattened leaf bases, were called *dumtx*, a term signifying "non-edible fern." During a field trip specifi-

cally undertaken to identify and collect *aġ*, plants of *Athyrium filix-femina* and *Dryopteris filix-mas*, and a small specimen of *D. expansa* were all classified as *dumtx* by Jeff Harris. The last was described as being almost like *aġ*, but too small. Its broken "fingers" or leaf bases had the distinctive pea green colour of *aġ*. It was collected in a small organic soil pocket in the hemlock forest, not in the snowbed or avalanche chute habitat preferred by the Gitksan in their interior geographic location. Larger, more robust specimens of *D. expansa*, found in the snowbed locality, were dug up and pronounced to be *aġ*, because of the relatively large size of the rootstock, the diameter of the "fingers," and their green color (Leslie M.J. Gottesfeld, unpublished notes, 1988).¹⁹

Additional insight into native perception and classification of ferns comes from Gordon Robinson, a Haisla elder from Kitamaat Village. When shown a specimen of *Dryopteris expansa* and asked if it was the edible fern root, he commented, "You can tell if it is the right fern if the 'fingers' are round [in cross section], pale green inside, and brittle. It grows in the forest on top of fallen logs and on stumps. It grows at the base of slide areas . . . You can kick it out of the ground or pull it out easily. Other ferns, you need a pick [to dig up] . . ." (Leslie M.J. Gottesfeld, unpublished notes, 1988).²⁰ It is significant that when one collects a fresh rootstock of *Athyrium filix-femina*, the "fingers" are tan inside, woody textured, and triangular in cross-section. In addition, the large, fibrous root system is very hard to pry out of the soil (Leslie M.J. Gottesfeld, unpublished notes, 1988).

Habitat considerations.—Locations where the edible fern rootstock grows in adequate abundance and quality for harvesting in British Columbia are generally scattered and infrequent. It is a slow-growing perennial fern and hence may be several years old before it is big enough to harvest. Following are some notations on the best habitats or localities observed for edible wood fern growth and/or harvesting (Native group and literature citation given in parentheses):

- near salmonberry bushes (*Rubus spectabilis*) (Tsimshian; Gorman 1896);
- hillsides and under cottonwood trees (*Populus balsamifera*) and alders (*Alnus rubra*); wooded locations up to 800 m (Tanaina; Kari 1987; Ray ca. 1980);
- "half way up the mountains" in "meadows" or "ravines" (avalanche tracks), open snowbed communities; best locations had ownership harvesting claims (Gitksan, Wet'suwet'en; Jeff Harris, Sr., Beverley Anderson, personal communication to LMJG, 1988);
- plentiful around Kuldo (deserted Gitksan village about 90 km north of Hazelton) and around other, modern Gitksan villages; Kuldo people were teased in song about their consumption of the fern rootstocks (Gitksan; 'Ksan, People of 1980);
- at the base of big cliffs in avalanche paths; areas frequented by mountain goats, who survive on wood fern rootstocks during the winter (Haisla; Gordon Robinson, n.d.; see note 20);
- higher elevations at the base of snow banks and rockslides (Nuxalk; Turner 1973);
- swampy areas (Mainland Comox; Randy Bouchard, personal communication to NJT from 1973 research);

—Fountain Valley, about 1.6 km past Rusty Creek, called *sts'ets'kwa7* after wood fern (Lillooet; Randy Bouchard, personal communication to NJT from 1974 research);

Because it is so infrequent and because harvesting eliminates an entire plant, care must be taken by those harvesting this food to leave sufficient plants behind in each locality for any future harvests, or entire populations of this historically important food plant could be eliminated.

Native food use of wood fern rootstocks.—A summary of ethnographic reports and native nomenclature for edible wood fern rootstocks is provided in Table 1. As shown in this table, edible wood fern rootstocks were used by virtually all Northwest Coast Native peoples of British Columbia, as well as by the Lower Thompson, Lillooet, Nishga, Gitksan, and Wet'suwet'en, by the southeast Alaskan and western Washington Indian groups, and even by some Eskimo peoples of Alaska. In all, folk names for this food were used in over 25 different Native languages in the region. Fig. 1 shows the extent of former wood fern use in northwestern North America.

TABLE 1.—Summary of ethnographic reports and native nomenclature for edible wood fern rootstocks.

Language (Family)	Native Name ¹	Identification; Notes; Reference
Nuxalk (Bella Coola, Salish)	<i>sq'wálm</i> (rhiz.); <i>sq'wálm-iixw</i> , <i>sq'walq'wálm-iixw</i> (plant)	<i>Dryopteris expansa</i> (most people), <i>D. filix-mas</i> (some people), and <i>Athyrium filix-femina</i> (some people, but probably mistaken) (Nancy J. Turner, unpublished notes, 1981, in possession of NJT; Turner 1973; Harlan I. Smith, unpublished notes, ca. 1920–22, National Museum of Civilization, Ottawa)
Lillooet (Salish, Interior)	<i>c'ókwa?</i>	<i>Dryopteris</i> spp. (Nancy J. Turner, Randy Bouchard, Dorothy Kennedy, Jan Van Eijk, unpublished notes, 1974–86, in possession of NJT); <i>Athyrium filix-femina</i> said by some to be "a kind of <i>c'ókwa?</i> ," but not the kind with edible rootstocks (cf. coll. V 88,796, 88,798–9, N. Turner: <i>D. carthusiana</i>).

Language (Family)	Native Name ¹	Identification; Notes; Reference
Thompson (Salish, Interior)	not recalled	<i>Dryopteris</i> spp. (Turner et al. 1990); eating of pit-cooked fern rootstocks recalled, but not identity; <i>c'úkwí7</i> , the term cognate with wood fern rootstocks in other languages, applied to fresh rhizomes of <i>Pteridium aquilinum</i> by Annie York
Comox (Salish, Coast)	<i>th'ékwa</i>	<i>Athyrium filix-femina</i> (Randy Bouchard, unpublished notes on Mainland Comox, 1973-76); identified from specimens by Bill and Rose Mitchell (Randy Bouchard Coll. Nos. 44, 4, V)
Sechelt (Salish, Coast)	<i>stsawch</i>	unidentified fern (<i>Athyrium</i> or <i>Dryopteris</i>) whose rootstocks with finger-like appendages were pit-cooked and eaten (Nancy Turner and Jan Timmers, unpublished notes on Sechelt ethnobotany, 1972, in possession of NJT)
Sechelt (Salish, Coast)	<i>ǰwúlhqw'at</i>	unidentified "type of fern, something like a turnip," with a texture "something like garlic," which grows in the mountains, especially at a place called <i>ǰénichen</i> (J. Joe, personal communication to Randy Bouchard, 1978)
Squamish (Salish, Coast)	<i>ts'ékwa7</i>	" <i>Dryopteris austriaca</i> " and, by some, <i>Polystichum munitum</i> also (rootstocks) (Bouchard and Turner 1976)
Halkomelem (Upriver) (Salish, Coast)	<i>th'ékwa</i>	"mountain fern with wide top" (Galloway 1982)
Clallam (Salish, Coast)	<i>tsa'qwa</i>	" <i>Dryopteris dilatata</i> " (Gunther 1973)

TABLE 1.—Summary of ethnographic reports and native nomenclature for edible wood fern rootstocks. (continued)

Language (Family)	Native Name ¹	Identification; Notes; Reference
Straits (Northern) (Salish, Coast)	<i>tsō'kwī</i>	(Kinkade 1989) ²
Straits (Lummi) (Salish, Coast)	<i>tsuk'kwa</i>	"small brake fern" (Kinkade 1989; original, George Gibbs 1863)
Lushootseed (Suquamish) (Salish, Coast)	<i>ts'E'kwi</i>	unidentified fern (Barbara Lane, personal communication to NJT, 1985; from unpublished notes of T.T. Waterman ca. 1920 and J.P. Harrington ca. 1910)
Lushootseed (Green River)	<i>t̄sō'kwī</i>	" <i>Dryopteris dilatata</i> " (Gunther 1973)
Lower Chehalis (Salish, Tsamosan)	<i>c'qwi?</i>	"fern sp." (Kinkade 1989, original from J.P. Harrington field notes, 1948)
Upper Chehalis (Salish, Tsamosan)	<i>c'aq'wé?</i>	"tiger-lily root" (Kinkade 1989)
Sahaptin (Taidnapam, Upper Cowlitz, or Yakima dialect) (Sahaptin)	<i>ts'kwai</i>	" <i>Dryopteris dilatata</i> " (Gunther 1973, who calls this language "Cowlitz;" M. Dale Kinkade, personal communica- tion to NJT, 1989)
Quileute (Chimakuan)	<i>ts'ikwí;</i> <i>c'iqwó pat</i>	"fern roots" (J.V. Powell and F. Woodruff in Gunther 1973; Powell and Woodruff, Quileute Dictionary,

Language (Family)	Native Name ¹	Identification; Notes; Reference
Kwakwala (Wakashan)	<i>tsákus</i> (rhizome); <i>tságanu</i> (leaves); <i>tsákusmes</i> (plant)	from M. Dale Kinkade, personal communication to NJT, 1989) " <i>Dryopteris spinulosa dilatata</i> ," <i>D. austriaca</i> and <i>Polystichum munitum</i> both types of which were eaten (Boas 1921, 1934; Curtis 1915, "wood-fern roots;" C. F. Newcombe ³ ; Turner and Bell 1973)
Haisla (Wakashan)	<i>t'ibàm</i> (rhizome); <i>t'ipàs</i> (plant)	Lincoln and Rath 1986 — "edible fern root;" "... plant, leaves" (cf. <i>t'ipa</i> "to step, tread on something"); Curtis 1907, "wood fern"
Heiltsuk (Wakashan)	<i>t'ibàm</i> (rhizome);	Brian Compton, personal communica- tion to NJT, 1988 ⁴ (cf. <i>t'ipa</i> "to step, tread onto something; to find fern roots or cockles by feeling with the feet"); Boas 1928 " <i>t'le'bEm</i> "—root of <i>Dryopteris austriaca</i>
Oowekyala (Wakashan)	<i>teí-pùm</i>	"fern-roots (wood fern)" (Curtis 1915)
Nuu-chah-nuulh (Hesquiat) (Wakashan)	<i>t'ipa'</i>	unidentified fern closely resembling <i>Dryopteris austriaca</i> and <i>Pteridium</i> <i>aquilinum</i> but not the same, whose rootstocks were eaten long ago (Turner and Efrat 1982)
Nuu-chah-nuulh (Clayoquot)	<i>tí-pa</i>	"fern-roots (wood fern)" (Curtis 1916)
Ditidaht (Wakashan)	<i>t'it'efsapt</i>	<i>Polystichum munitum</i> (Turner et al. 1983); (cf. <i>t'it'efs</i> "crouching" for

TABLE 1.—Summary of ethnographic reports and native nomenclature for edible wood fern rootstocks. (continued)

Language (Family)	Native Name ¹	Identification; Notes; Reference
		fiddlehead shoots); rootstocks pit-cooked and eaten.
Quileute (Chimakuan)	<i>ts'ikwi</i>	<i>Polystichum munitum</i> (roots) (Gunther 1973); Quileute said to bake rhizome in a pit and eat with salmon eggs.
	<i>tseqwē'</i>	<i>Athyrium filix-femina</i> (root) (Gunther 1973); Quileute said to eat roasted, peeled rhizomes
Coast Tsimshian (Tsimshian)	<i>'ahh'</i> ; <i>aa</i> (?)	<i>'Aspidium spinulosum</i> var. <i>dilatatum'</i> (Gorman 1896); <i>'an edible root; a root medicine'</i> (Dunn 1978)
Nishga (Tsimshian)	<i>aǔ</i>	<i>'? Athyrium filix-femina'</i> (McNeary 1974)
Gitksan (Tsimshian)	<i>aǔ</i>	<i>'Cystopteris bulbifera'</i> ('Ksan, People of 1980); <i>'Dryopteris filix-mas'</i> (Gitanyow Summer Student Research Program 1984); <i>Dryopteris expansa</i> (Leslie M.J. Gottesfeld, unpublished notes, 1987, 1988)
Tlingit (Tlingit)	<i>k'wâlǔ</i> , <i>k'wAłx</i>	<i>Dryopteris expansa</i> (Leslie M.J. Gottesfeld, unpublished notes 1987, 1988); <i>'Dryopteris spinulosa'</i> (Swanton 1909)
Chilcotin (Athapaskan)	<i>ʔax</i> ⁵	Nancy J. Turner (unpublished notes, 1988); Teit (1909:780) noted that <i>'fern-root'</i> was eaten by the Chilcotin; Morice (1893) stated that <i>'ah'</i> was not found in Chilcotin country

Language (Family)	Native Name ¹	Identification; Notes; Reference
Carrier (Athapaskan)	“ <i>·ah</i> ”, or <i>ah chún</i>	Morice (1893); second term from Smith (unpublished notes on Carrier, ca. 1920–22)—identified as “Shield Fern” (see note in text)
Wet’suwet’en (Athapaskan)	<i>di yii’n</i>	<i>Dryopteris expansa</i> (Leslie M.J. Gottsfeld, unpublished notes 1987, 1988)
Tanaina (Athapaskan)	<i>uh</i>	<i>Dryopteris dilatata</i> (Kari 1987)
Haida (Skidegate) (Haida)	<i>ts’ágwl; djagwal; skyaw</i> (“tail”)	applied variously to large, edible rootstocks of <i>Dryopteris austriaca</i> , <i>Polystichum munitum</i> , <i>Athyrium filix-femina</i> (Turner, unpublished notes on Haida, ca. 1971; see Note 3 in text)
Haida (Masset) (Haida)	<i>ts’ágwl; tanskyaw</i> (“black-bear’s tail”); <i>snán-djang</i>	applied variously to large, edible rootstocks of <i>Dryopteris austriaca</i> , <i>Polystichum munitum</i> , <i>Athyrium filix-femina</i> (Turner, unpublished notes on Haida, ca. 1971; see Note 3 in text)
Haida (Kaigani) (Haida)	<i>sk’yáaw</i> (rhizome)	“ <i>Thelypteris limbosperma</i> ” (Norton 1981); specimen later reidentified by Adolf Ceska as <i>Athyrium filix-femina</i>
Western Eskimo (Inuit)	<i>wingísuk</i>	<i>Dryopteris dilatata</i> (Oswalt 1957)

¹Orthography used in original source is given, except $\underline{k} = q$; $\underline{x} = \check{x} = \dot{x}$. For simplicity, not all reported terms for *Athyrium filix-femina* or *Polystichum munitum* are included in this table, only those cognate with terms applied to *Dryopteris* spp. or directly associated with reports of edible rootstocks.

²M. Dale Kinkade (personal communication to NJT, 1989) notes that the name for spiny wood fern is reconstructable in Proto-Salish, and hence provides evidence for coastal origins for Salish (cf. Kinkade 1989).

- ³C.F. Newcombe gives several variations of the term *tsakos* in various parts of his unpublished notes and manuscripts (Newcombe Coll. Vol. 43, File 36, ca. 1922, Provincial Archives of British Columbia); at least two were confirmed by Kwakwaka'wakw speaker and linguist George Hunt; all refer to "*Dryopteris dilatata*" or its synonyms.
- ⁴Brian Compton compiled a comprehensive list of fern names for Kwakwaka'wakw and related languages, entitled "North Wakashan Pteridophyte Nomenclature & Terminology" (1988), which contains a much more complete list of fern species and related terminology in Kwakwaka'wakw, Haisla, Heiltsuk, and Oowekyala (Rivers Inlet) (ms. in possession of Brian Compton, Department of Botany, University of British Columbia, Vancouver, BC).
- ⁵This name was given by Robert Tyhurst (1975–76, unpublished notes on Chilcotin ethnobotany, in possession of RT, Victoria, British Columbia) as bracken fern (*Pteridium aquilinum*), but recent evidence suggests a *Dryopteris* species, from the descriptions of the clustered rootstocks.

Many descriptions exist of the edible wood fern and its use. The rootstocks with their attached leaf bases have been variously described as "like 2 hands clasped together" (Norton 1981; B. Lane, personal communication, 1984), "like a woody sweet potato" ('Ksan, People of 1980), "resembling a bunch of bananas" (cf. Kari 1987; Ray ca. 1980; Turner 1973), "like a pineapple" (Harlan I. Smith, unpublished notes ca. 1920; Turner 1973), a "big root with little fingers" (Willie Matthews, Haida elder, tape transcript by Nancy J. Turner, ca. 1970), or having many brown "fingers" growing around it (Turner 1973). The "good" fingers are succulent. Figures 2–4 show the characteristics of the edible wood fern (i.e., *Dryopteris expansa*).

Gitksan elder Jeff Harris Sr. described the edible fern rootstock as being about as big as his hand (fist), and noted, ". . . when you take them out the root tapers down to the bottom, when you dig it out, and crooked. You have to take the little piece of the bottom part out because it's small . . . that [leaf base] would be about the size of your little finger . . . the banana-like root. You take them off and peel it with your finger . . ." (Leslie M.J. Gottesfeld, unpublished notes, 1987). The fern rootstock is described as being greenish inside when raw, but turning to yellowish or orange when cooked (Jeff Harris, David Green, Lizette Naziel, personal communications to LMJG, 1987).

Harvesting.—The rootstocks were usually dug in spring or fall (cf. 'Ksan, People of 1980). The Nuxalk name for the fourth moon after the summer solstice is called *siqaalxmanm* (lit. "time to get *sq'wálm*"). At this time, many of the "fingers" on the rootstock are plump and round, whereas earlier many are flat and no good for eating. Potatoes are dug at this time too, according to Margaret Siwallace (Turner 1973). However, the wood fern rootstocks could be dug out even in December if it was a mild winter, and could be dug from under the snow if necessary. Wet'suwet'en consultants stated that wood fern rootstocks should be gathered in fall after the leaves wither or in the winter (Josephine Michell 1987, Madeline Alfred 1988, Lizette Naziel 1987, Sara Tait 1988, all personal communications to LMJG). It was stated that the rootstocks are not damaged by freezing and could be dug from under the snow. A special wooden snow shovel was

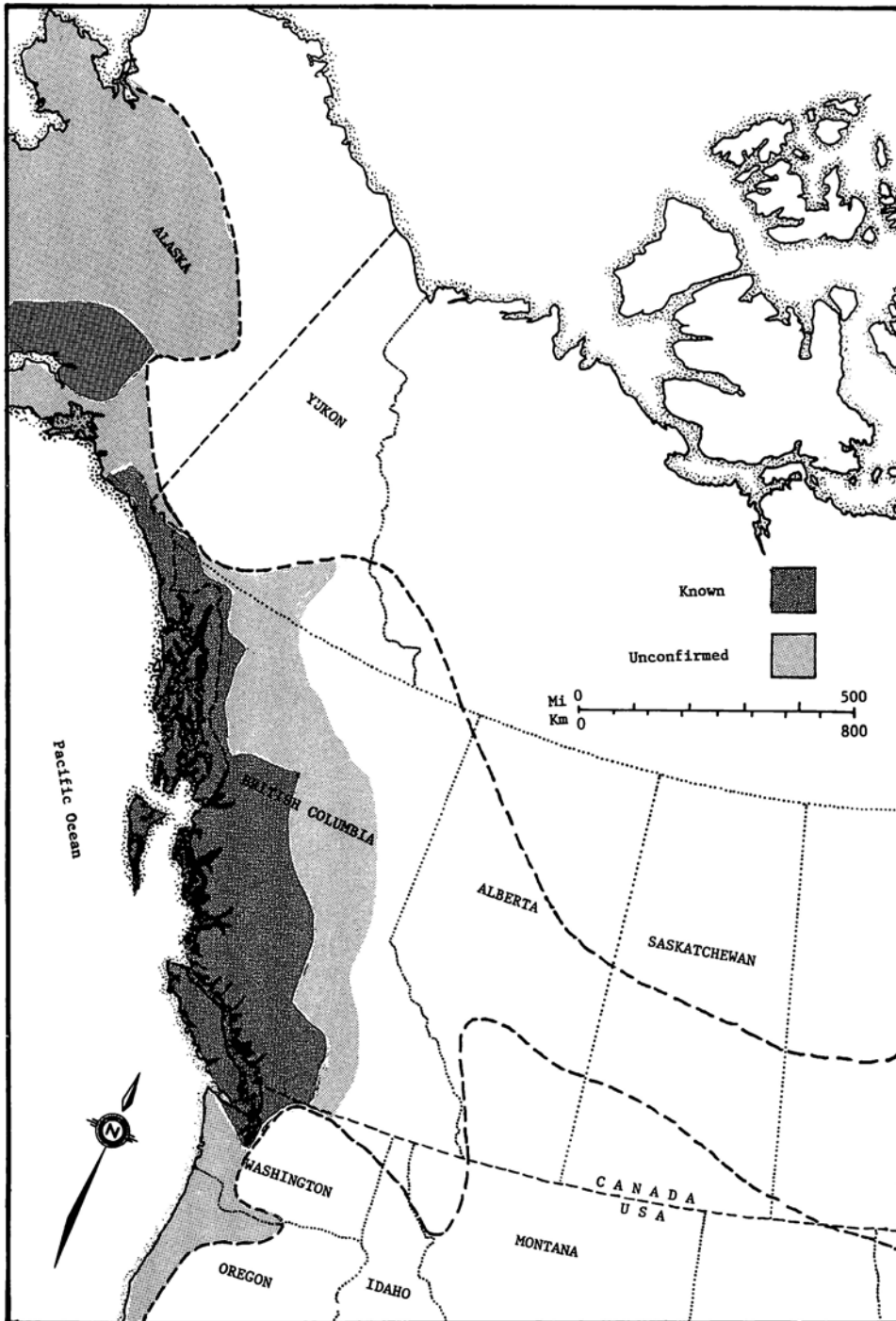


FIG. 1.—Extent of former use of edible wood fern (mainly *Dryopteris expansa*) in northwestern North America. (The heavy dotted line shows the approximate distribution of *Dryopteris expansa* over the same area.)

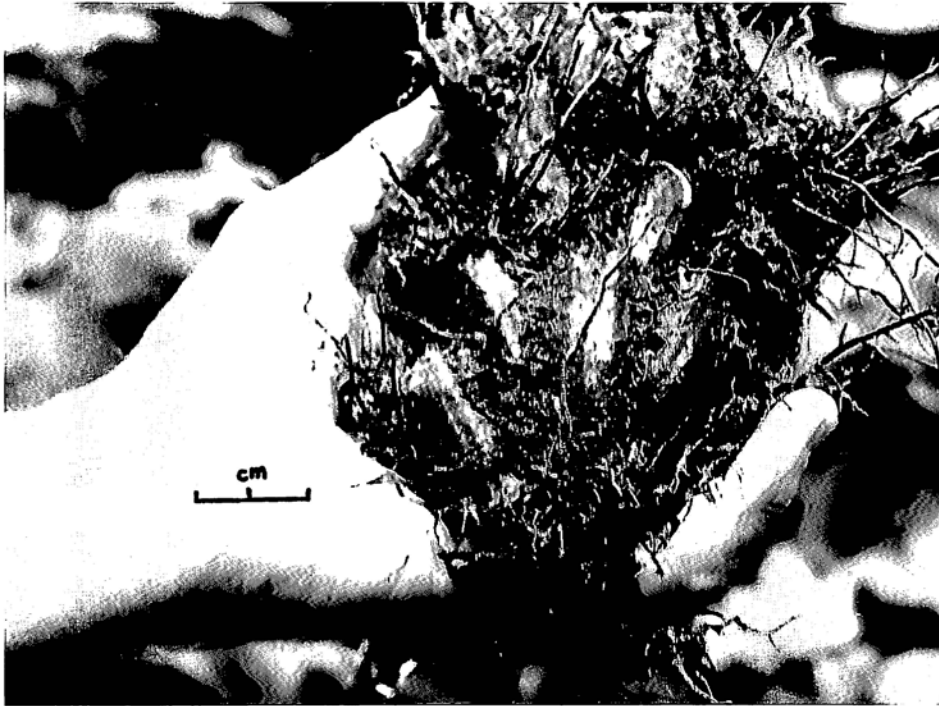


FIG. 2.—Rootstock of *Dryopteris expansa*, showing “finger” formation of leaf bases from previous years’ fronds.

used to uncover the plants (Madeline Alfred, personal communication to LMJG, 1988). Gitksan consultants stated that fern rootstocks were gathered in fall, winter, or spring before the fronds begin to uncurl. Plants were located by the “whitish stick sticking up” or the “curly leaf” (fiddlehead). Digging the rootstocks out of frozen ground was laborious, but their availability in the winter season made them a valuable food. Some Tanaina people say they can be dug at any time of the year, but others say that they are dry and unpalatable during the summer months. Some say the rootstocks are juiciest and most palatable in the fall, others in the spring (Kari 1987).

Since the rootstocks were usually sought after the tops had died down, finding them was sometimes difficult. The Haisla and Heiltsuk people evidently had a unique way of locating them with their feet, as alluded to in their term, *t’ipa*, meaning “to step, tread onto something; to find fern roots or cockles by feeling with the feet” (Heiltsuk), and in *t’ips*, meaning “one’s feet touching the ground (as when feeling for fern roots)” (Heiltsuk) (Brian Compton, personal communication to NJT, 1988; terms given to him by Kitlope elder, Gordon Robertson; see also Lincoln and Rath 1986 for Haisla). It is not clear whether the actual names for the edible wood fern are derived from these terms, or vice versa.²¹ According to Gordon Robertson (Brian Compton, personal communication, 1988), a special digging stick was used to dig up wood fern rootstocks. It was similar

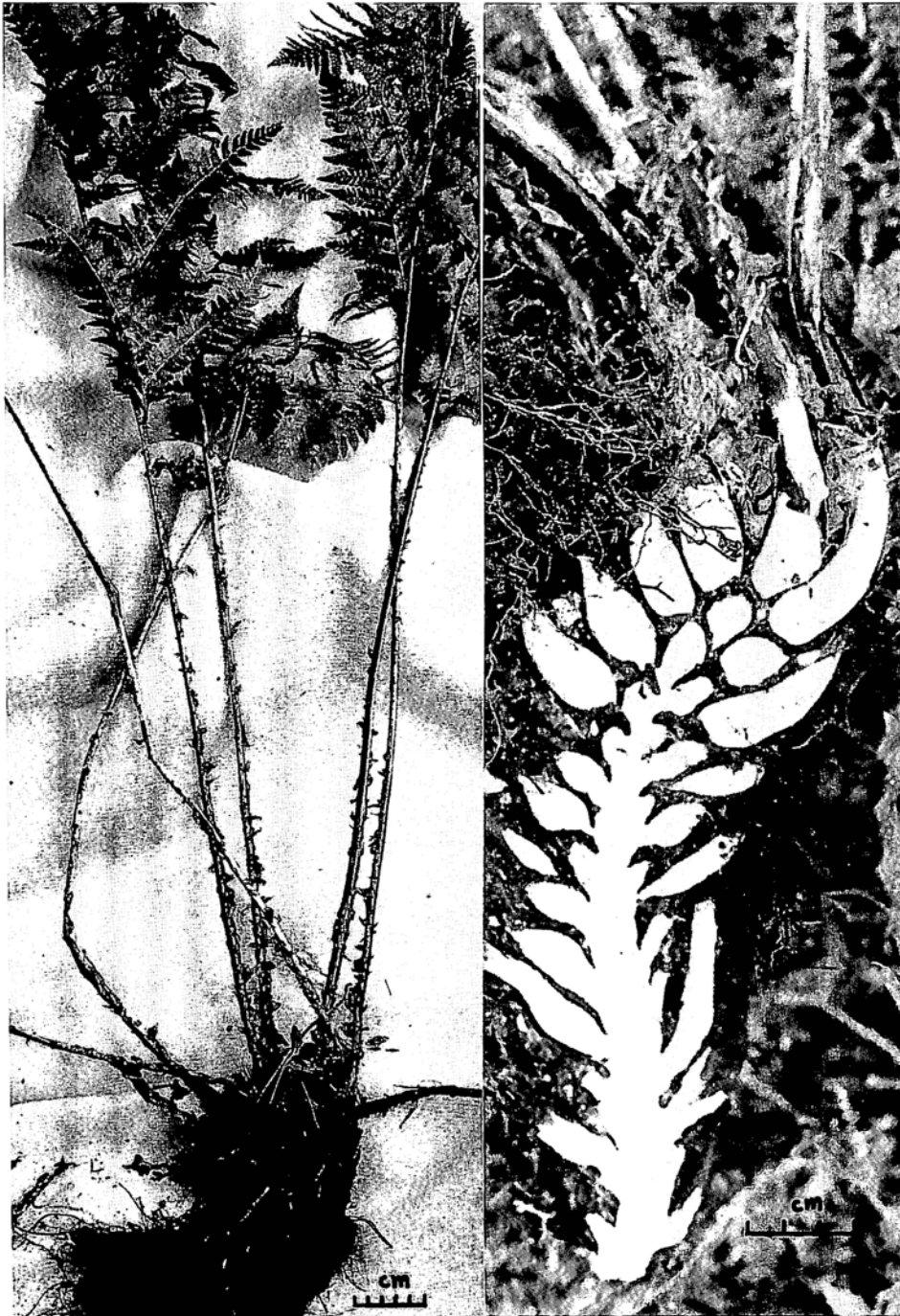


FIG. 3.—*Dryopteris expansa*, rootstock and fronds, taken at Bella Coola, and identified by several Nuxalk elders as the edible type of wood fern (left).
FIG. 4.—Cross-section of *Dryopteris expansa* rootstock (right).

to the stick used for other edible "roots," but shorter (about 30–45 cm long) and with a flattened point and a round portion on the upper end similar to a nail head. The stick, called *cagàyu* in Haisla, was pushed into the ground with the foot and then pressed down like a lever to remove the root from the soil. Recently, a shovel would be used for this purpose. Boas (1921) also reports the use of a digging-stick, of yew-wood, for prying up the fern rootstocks, which were then placed into a large basket. The Tanaina generally obtain wood fern rootstocks by chopping them out of the ground with an axe (Kari 1987).

Harvesting and cooking of the wood fern rootstocks, like the harvesting of most plant foods, was apparently undertaken mainly by women (cf. Boas 1921), but men also dug them ('Ksan, People of 1980).

Storage.—Harlan Smith (unpublished notes, ca. 1920) maintained that wood fern rootstocks ". . . were always cooked [by the Carrier and Nuxalk (Bella Coola)] the same day they were gathered. They were never kept." Morice (1893) noted that the rootstocks were not dried, but only eaten fresh after pit-cooking. Once cooked and mashed, the food only kept one or two days, according to Smith's Carrier consultant.

The Wet'suwet'en evidently gathered fern rootstocks for storage as well as harvesting them if needed after snow was on the ground. Elsie Tait of Hagwilget stated:

In the old days [the women] would get together and leave Hagwilget to go up to Blue Lake. Above Blue Lake . . . they would dig a whole bunch [of fern rootstocks]. Then they would build fires. . . . They would put the fruit [rootstocks] under the rocks to cook it. They would preserve it for the winter. They lined cedar boxes with skunk-cabbage leaves [*Lysichitum americanum*] and preserved all that fruit in there. They sealed the boxes up and dug the ground like cellars. . . . They would preserve all those things for winter, put them away and save them until the hungry time [late winter]. (personal communication to LMJG, 1986).

The Haisla of Kitamaat Village also formerly stored fern rootstocks for winter. Gordon Robinson recounted:

In the old days each family would pick ten sacks, or baskets of *t'ibam* [fern rootstock]. They would bury it in the corner of the long house. Like a root cellar. They break the base off. It is a useless part. They pick it in the fall . . . (personal communication to LMJG, 1988).

The Kwakwaka'wakw (Southern Kwakiutl) spread wood fern rootstocks out to dry on a mat the day after they were harvested, then cleaned them using a special red-cedar-wood scraper, and stored them in a basket in the rear of the house, behind the fire, for 12 days before they were pit-cooked. After they were cooked, they were stored another four days before being served at a feast (Boas 1921). The Mainland Comox also stored them prior to cooking in a cool, dry place, in an open-work basket (Randy Buchard, unpublished notes, 1973)²²

The Gitksan, too, commonly store edible fern rootstocks. After they were dug, they might be left in a dry shed or cabin, covered with brush and leaves, for a long period of time, "when other food supplies ran out" ('Ksan, People of 1980:79).

In Alaska, Tanaina people are said to preserve wood fern rootstocks by placing them in an underground cache or by storing them in oil or lard (Kari 1987). The Yakutat people also stored them in a pit cache, and in general stored them in a way similar to potatoes. They also keep well for several months in a refrigerator, according to Ray (ca. 1980).

Traditional cooking and serving methods.—Wood fern rootstocks were hardly ever eaten raw, although the Nuxalk people sometimes ate them raw as an antidote for shellfish poisoning.²³ Baking or steaming the rootstocks in a pit was by far the most common traditional method of preparation. Detailed published accounts of pit-cooking them are provided in Gorman (1896:78–79) and Boas (1921:518–523). In the former description, the Coast Tsimshian of southeastern Alaska placed the rootstocks in cooking pits interspersed with damp moss or kelp and cooked them overnight (about 14 or 15 hours). In Boas's Kwakwaka'wakw (Southern Kwakiutl) account, seaweed and hemlock branches (*Tsuga heterophylla*) were used to surround the rootstocks, which were also cooked overnight. Members of the household were asked abstain from sexual intercourse during the cooking time.

Similar descriptions of pit-cooking wood fern rootstocks are provided by many others (cf. Morice 1893; Boas 1921; Harlan I. Smith, unpublished notes on Carrier and Bella Coola, ca. 1920–22; Nancy J. Turner, unpublished notes on Haida, 1970, 1971; 'Ksan, People of 1980; Leslie M.J. Gottesfeld, unpublished notes on Gitksan, Wet'suwet'en, and Haisla, 1987, 1988; Jacobs and Jacobs 1982; Kari 1987). Gitksan elder Jeff Harris Sr. said that the rootstocks were arranged in the pit ". . . Just like putting apples" [placed upright, in growth position] and were covered with hemlock boughs (personal communication to LMJG, 1987). The Wet'suwet'en covered them with birch bark (Leslie M.J. Gottesfeld, unpublished notes 1987). The Tanaina sometimes wrapped them in birch bark for baking and covered them with hot sand (Kari 1987). Haisla people used to cover the rootstocks with hot embers of a fire and leave them to bake overnight (Gordon Robinson, personal communication to LMJG, 1988). The Haida used to line their steaming pits with skunk-cabbage leaves. The Carrier were said to use alder bark chips in the steaming pit (Morice 1893). The Mainland Comox cooked the rootstocks they call *th'ékwa* (identified as *Athyrium filix-femina*; R. Bouchard Coll. No. 44 and No. 004; May 1975, May 1976 V) in a pit, but simply by throwing them directly into a bed of glowing hot coals and ashes from a fire and covering them with several inches of ashes (Randy Bouchard, unpublished notes on Mainland Comox ethnobotany, personal communication 1973, 1975 to NJT). In recent times, people have boiled the rootstocks in water for a long time, until they are tender; sometimes the water is changed during boiling (Kari 1987). One Hydaburg woman suggested pressure cooking them to reduce the cooking time (Ray ca. 1980). In Bella Coola today, pressure cooking is the method of choice for preparing wood fern rootstocks for feasts. The use of the rhizomes as a soup thickener was sug-

gested by Ray (ca. 1980). Some Gitksan people now preserve the rhizomes by canning ('Ksan, People of 1980). When not properly cooked, the rootstocks are described as rubbery and hard (Mark Jacobs Jr. of Sitka, personal communication to LMJG, 1988).

Boas (1921:523-524) provides a detailed description of the serving of wood fern rootstocks at a Kwakwaka'wakw (Southern Kwakiutl) feast, which was held four days after the fern roots had been in the house and had been cooked. The roots were considered a "really valuable food," and were often served with oil and dry silver-salmon spawn to the chiefs of the tribes. A chief could peel and eat the outer fern roots, but was supposed to give away the inner part of the fern root, not to eat it himself, or "he will always waver in his mind about giving away blankets . . ." After the feast, each guest was given two fern roots to take home to his wife.

There are many other reports of the rootstocks being cleaned, the leaf bases being removed, peeled, and eaten one at a time. Similarly, many reports refer to the eating of the rootstocks with oil, grease, lard, and/or salmon roe (cf. Nancy J. Turner, unpublished notes on Haida, 1971; Turner 1973; Randy Bouchard, personal communication to NJT, 1973 for Mainland Comox; 'Ksan, People of 1980; Kari 1987; Brian Compton, personal communication to NJT, 1988, for Haisla; Leslie M.J. Gottesfeld, unpublished notes on Gitksan, Haisla 1987, 1988). The Haisla, for example, ate them mixed with *ooligan* grease in a big bowl (Brian Compton, personal communication to NJT, 1988, from Gordon Robertson), or ate them with fermented or dried salmon roe (Gordon Robinson, personal communication to LMJG, 1988). The leaf bases, once removed from the main rootstock, were usually peeled with the fingers before being eaten, then dipped into the oil. The Mainland Comox dipped them into seal oil and ate them with dried salmon eggs (Randy Bouchard, unpublished notes on Mainland Comox ethnobotany, personal communication to NJT 1973, 1975). The Nuxalk ate them with grease or fermented salmon roe (McIlwraith 1948; Turner 1973). In modern times, the Gitksan ate them with sugar ('Ksan, People of 1980).

Kari (1987) notes that some Tanaina people state that only the "stem" portion of the underground part is eaten, others that only the "leaf bases" are eaten, and still others that both parts of the rootstock are eaten. Gitksan consultants say both "stem," and "leaf bases" can be eaten.

The Carrier, after pit-cooking the rootstocks, pounded them up with two stones, the upper one apparently a pestle, and the lower one flat (Harlan I. Smith, unpublished notes on Carrier and Bella Coola, ca. 1920-22). Smith noted that "Sometimes the Ulkatcho Carrier Indians went to Bella Coola and traded moccasins for pestles and other kinds of goods . . ."

Oswalt (1957) reported that the rootstocks of "*Dryopteris austriaca*" were occasionally collected, boiled in water, and added to *agútuk*, or "Eskimo ice cream."²⁴

Sometimes the rootstocks were simply roasted in the fire, covered with a hot stone, if there were not enough to pit-cook ('Ksan, People of 1980).

Other food uses.—The Tanaina and other southeast Alaskan natives eat the young croziers, or "fiddleheads" of wood fern (*uh*), cooked or steamed, as an early spring

vegetable, and many southeast Alaskans can them for winter use (Kari 1987; Heller 1976). The Kaigani Haida are said to boil and eat the "fiddleheads" (of "*Thelypteris*"; see Table 1) as a vegetable at present (Norton 1981). According to Ray (ca. 1980), fern fiddleheads, commonly eaten among many Native peoples of Alaska today, are not known to be a traditional food. He provides recipes and suggested methods for canning and freezing these greens. Some Tanaina people also used wood fern rootstocks for making beer, a practice they probably learned from the Russians, according to Kari (1987).²⁵

Survival and famine food.—As recounted by Peter Kalifornsky of the Outer Inlet Tanaina (Kari 1987:130), the rootstocks were formerly regarded as a good survival or starvation food:

In the early spring one year, the people ran out of food. They divided into two groups, one moving up into the higher country to dig *uh* [Tanaina name for edible wood fern; see Table 1], and the other to dig clams. Those people who lived on ferns received back their strength and gained weight, while those that lived on clams barely survived.

In winter and early spring, the rootstocks had to be chopped out of the ground, after a fire was first built over an area where the ferns were known to grow in order to thaw the ground (Kari 1987). The Tlingit (Jacobs and Jacobs 1982) and Gitksan ('Ksan, People of 1980) also state that wood fern can be a survival food: "It has warded off starvation more than once." ('Ksan, People of 1980:79). Mark Jacobs Jr. of Sitka (personal communication to LMJG, 1988) stated that perhaps fern rootstocks were eaten sometimes as an ordinary food, but they were mainly used as a survival food by the Tlingit. Gitksan and Wet'suwet'en stories also refer to fern rootstocks as a survival food. A woman who was banished from Moricetown survived through the winter on fern rootstocks and salmon roe according to a Wet'suwet'en story (Alfred Joseph, personal communication to LMJG, 1986). Jeff Harris Sr. mentioned a Gitksan legend about a period of starvation: "There in the famine some people eat *ax̄* [fern rootstock]. They lived. Others go to get *xsu'u* [hemlock cambium] but they all died." (personal communication to LMJG, 1988).

Use frequency and taste appreciation of wood fern rootstocks.—An interview study of 61 adult Nuxalk women in three generations, representing the Nuxalk reserve in Bella Coola, was conducted in 1982 as part of the Nuxalk Food and Nutrition Programme. Each woman was asked for her family's use for wood fern "root" (and other traditional food species as well), and a score of her impression of her own personal taste appreciation of the cooked root "fingers." Of the 61 women, only six (all elders) reported ever tasting the root food. On a scale of 1.0 (not used) to 4.0 (used more than one time per week when available and in season), the women reported a mean use frequency today of only 1.3 (very low) but in their earlier days they used it to a greater extent, with a score of 2.8 on a scale of 1.0 to 4.0, which represents use of approximately once or twice a month. These women reported never to have preserved or stored the roots (in cellars or otherwise) for later use.

The mean taste appreciation score of the six women was 4.3, in a scoring scale of 1 to 5, with 5.0 being the highest possible (best tasting food), indicating these women enjoyed this food. Details of the methodology are reported elsewhere (Kuhnlein 1989a).

Gorman (1896:79) described the taste of wood fern rootstocks as, "slightly sweetish" but "too smoky and tobacco-like in flavor for the average white man's palate, except under stress of hunger." He added, ". . . I have no doubt it is quite nutritious." The Tanaina also considered *uh* to be very nourishing, as indicated from their previously related use as a survival food (Kari 1987). Jacobs and Jacobs (1982) describe the edible portion as being "light brown like squash and tastes about the same." Haida elder Willie Matthews described the cooked "fingers" (leafstalk bases) as "just like potatoes inside" (Nancy J. Turner, unpublished notes, 1971). Ray (ca. 1980) noted that the raw rhizomes of the wood fern ("*Dryopteris dilatata*") are bitter, but sweet tasting when cooked. He said they are salmon colored, with texture and taste very similar to sweet potato. The Gitksan people also describe the edible fern as having the same texture and color as a sweet potato when cooked, and believe it to have "considerable food value" ('Ksan, People of 1980:79). One Lillooet elder described the taste as "very much like coconut" (Randy Bouchard, personal communication to NJT, 1974).

Nutrient analyses.—During the late summer and early fall of 1982, in the course of a general series of analyses of traditional foods carried out under the Nuxalk Food and Nutrition Programme, approximately 30 wood fern rootstocks were dug with the supervision of Nuxalk elder Felicity Walkus. These were cleaned in the traditional manner by washing with water and then (for convenience) cooked by pressure cooker until soft. The cooked roots were then peeled, and 250 g were frozen together in a plastic bag and shipped to the laboratory. A similar sample was prepared in 1983.

The laboratory samples were mixed with equal weights of distilled, deionized water, blended in a glass container with stainless steel blades and processed through various nutrient analyses. The details of these methods are reported in Kuhnlein et al. (1982) and Kuhnlein (1989a, 1989b).

Results of the nutrient analyses of the wood fern "root" samples are presented in Table 2, together with reported values for the common potato, baked in the skin. It can be seen that there is reasonably good agreement between the two foods for water, protein, ash, carbohydrates (computed by difference between total weight minus the sum of protein, fat, moisture, fiber, and ash) and approximate energy computations. In contrast, mineral values in fern "root" were much higher for calcium, magnesium, zinc, copper, and manganese, but higher in potato for sodium and iron. The differing values may have been in part due to contributions from the skin of the roots, since it is known that skins of root foods are more mineral-rich than the starchy flesh. These minerals can migrate into the flesh during cooking.

The proximate composition of fern "root" is in good agreement with that reported for *Trifolium wormskioldii* (springbank clover rhizomes) and *Potentilla anserina* ssp. *pacifica* (Pacific silverweed roots) (Kuhnlein et al. 1982). For mineral composition, fern "root" was slightly higher in calcium, phosphorus, and

TABLE 2.—Nutrients in cooked fern root (*Dryopteris expansa*) in comparison to cooked potato, per 100 g edible portion.

Nutrient	Fern Root*	Potato**
Water, g	68.4	71.2
Protein, g	2.5	2.3
Fat, g	1.0	0.1
N.D. Fibre, g	3.7	n.a.
Ash, g	0.8	1.2
Carbohydrate, g	23.6	25.2
Calcium, mg	56.3	10.0
Phosphorus, mg	62.6	57.0
Sodium, mg	1.4	8.0
Magnesium, mg	44.4	27.0
Iron, mg	0.8	1.4
Zinc, mg	1.5	0.3
Copper, mg	1.5	0.3
Manganese, mg	3.2	0.2

*n = 2 independent samples, analyzed in triplicate.

**Watt and Merrill (1975:106), potatoes baked, flesh and skin, n = 12.

magnesium. However, fern root contained zinc, manganese, and copper (1.5, 3.2, and 1.5 mg/100 g respectively) at least an order of magnitude higher than that found in silverweed roots, clover rhizomes, or potato (ranging from 0.2 to 0.8 mg for these three minerals in the three foods).

While nutritionally essential minerals are important to consider in these root foods, it must be kept in mind that the majority of minerals in the traditional diet are provided on a year round basis in fish and game. In contrast to these animal foods, the roots provide a minimal proportion of daily mineral needs.

In general, the ethnographic accounts give the impression that wood fern rootstocks were always an occasional food, used seasonally, prepared for feasts, or prepared for a taste treat. It was also quite labor-intensive for harvesting, pit-cooking, and peeling of the small "fingers" before eating. With these considerations in mind, one has to assume that fern rootstocks did not contribute a major proportion of the bulk, or of the energy value of the annual diet. Rather, they contributed variety and aesthetic values, and could be relied on as a famine food, since the ferns were accessible even in winter to those who knew where to look for them.

Medicinal uses of wood fern and related types.—A significant use by the Nuxalk of *Dryopteris expansa* ("*Aspidium cyclosorum*") was eating the rootstock raw to neutralize poisoning from eating several kinds of shell-fish in the early part

of the summer (presumably paralytic shellfish poisoning, but not proven as such) (Smith 1928). The physiological basis for this application is not clear. Possibly, the information relates to the use of *Dryopteris filix-mas* rootstocks as an anthelmintic or vermifuge drug (Claus et al. 1970). Incidentally, we could find only one reference to use of a fern as a vermifuge by Native peoples in the study area: Smith (1928) noted that the Northern Carrier boiled the root of a fern ("species uncertain") and drank the decoction for worms.

Most other medicinal uses of wood fern and its relatives were as poultices for skin ailments. The Clallam of Washington pounded the roots of "*Dryopteris austriaca*" and used the pulp as a poultice for cuts (Gunther 1973), and the Inland Tanaina boil the rootstocks of *uh* (apparently including both *Dryopteris expansa* and *Athyrium filix-femina*) in water and use the liquid as an eye wash and as a wash for cuts. The decoction is also drunk for tuberculosis, kidney troubles, and respiratory problems such as asthma (Kari 1987). The Haida used the boiled, mashed rootstocks of sword fern (*Polystichum munitum*), which were called by the same Haida name as "*Dryopteris austriaca*" by several Native consultants, as a poultice for cuts and swellings (Nancy J. Turner, unpublished notes, 1971).

Other, miscellaneous uses.—The thin, wiry roots of "*Dryopteris austriaca*" were sometimes used by the Kwakwaka'wakw (Southern Kwakiutl) as the burning material in a "slow match." They were enclosed within a clam or mussel shell and ignited. The shell could then be buried and the fern roots would smoulder for several days (Turner and Bell 1973).

The Upriver Halkomelem people sometimes gather the fronds of the "mountain fern" (*Dryopteris* sp.) for use by florists (Galloway 1982). The Western Eskimo of Alaska have used the fronds of "*Dryopteris austriaca*" in recent years to decorate the inside of the church and the graves in the cemetery on certain church holidays. Additionally, ferns were described as having adorned some of the ceremonial masks used by the Kodiak Island Eskimos (Oswalt 1957).

Gunther (1973) notes that the Snohomish (Lushootseed) soaked the leaves of *Dryopteris austriaca* for a hair wash. The Haida used the dried fronds for bedding and to inter-layer between drying fish to prevent molding (Nancy J. Turner, unpublished notes, 1971).

Mythology and traditional beliefs.—Edible wood fern is featured in several myths within the areas where it was used. There are at least two myths explaining the origin of this food, one Tlingit and one Lower Lillooet. In the Tlingit account, the head of an orphan girl entrapped by a landslide near her village was transformed into a fern root (*k!wAłx*), while her body became a ground hog (marmot) (Swanton 1909:180).²⁶ In the Lillooet episode, part of a much longer, more complex story called *Kaiyám*, a blind old woman was transformed into a wood fern plant by her angry husband because she had allowed their grandson to be stolen. He took her up and jammed her nose into a log, saying . . . , "There! You shall become a *Tsúkwa* [wood fern]. By and by people will eat you . . ." (Hill-Tout 1905:177).²⁷

There are two other short episodes in Tlingit mythology concerning the wood fern. One is about its transformation by Raven, told within a long story of how Raven changed people, animals, and plants into their present form (Swanton 1909:18). The other is about a man who was aided in becoming a hunter by a supernatural mountain being. The man was warned that the green fern roots, which grow wherever there are grizzly bears, were not to be used because they belonged to the mountain being (Swanton 1909:358). Other mythical accounts of wood fern have not been previously published.

The following story about *Sq'wálm*, Wolverine, and Raven is shared in Kimsquit (Nuxalk, or Bella Coola) and Heiltsuk mythology, according to the late Margaret Siwallace, whose father, Joe Saunders, had told it to her around 1940:

Wolverine went up to a certain mountain [above Kimsquit] to hunt for mountain goat. He was sitting by the fire roasting *sq'wálm* on a stick when the supernatural being who is the "go-between" between mountain goat and people (he is half goat, half person, sort of like the mythical centaur) came along. "What are you doing?" he asked. Wolverine lied, "Roasting mountain goat kidney." Then the goat-person tested his bow. He shot in several directions and each time he shot a mountain goat. He peeled away the fat from around the stomach of each and gave it to Wolverine. Wolverine took it home and gave it to his children, who had a great time roasting it over the fire and eating it. Raven's children were nearby and wanted some, but they were not invited to eat. Wolverine told Raven how he got it.

The next day, Raven decided to get some mountain goat fat for his children. He went up and was roasting some *sq'wálm* over the fire when the goat-person came. However, when he asked what he was doing, Raven answered the truth—roasting *sq'wálm*. Goat-person did not test his bow and Raven got no mountain goat fat from him. He went down the mountain, wondering how he would feed his children. He slit his own breast open and removed the fat from his front. He gave it to his children telling them it was mountain goat fat. But when his children held it up to roast it, he kept calling, "It burns, it burns, it burns!" When they ate it, he still said that. (The late Margaret Siwallace, personal communication to NJT, 1983.)

According to Gitksan elder Jeff Harris Sr. people used to tell stories about fern root in the community house. He has given permission for the following story to be reported here, in his own words as told in English:

There was a family of four: a man and his wife and two children. The older one was a girl and the small one a boy of three or four. When they ran out of food in the spring time there was still snow upon the "ravines." They used a wood paddle or shovel or spade, *sin t'ul*, to scrape aside the snow [on the "ravine"]. They find *ax̄*. The stems still come up under the snow. They gather it all up and roast it under fire.

The girl is looking after the little boy at the camp while the mother is [about 300 m] from the camp. The little boy cries. The girl is looking after the boy. The girl hollered to her mother, "The baby is crying." The mother replied, "Mi 'ooda lus todzin. Mi' 'ooda." She meant, put some *ax̄* in the ashes, prepare a bit of food for the boy.

The girl got it wrong and threw her brother in the fire. She hollers, "I threw him in the fire but he kept on coming back!" The boy got burned.

The story continues with an account of how a stranger dressed in black, a bear person, appeared and told the family how to use bear oil or fat on burns as an ointment or medicine. Harris explained that rendered bear fat could be used as grease when eating fern root, which may explain the linking of the story of the bear offering his fat to the eating of fern root.

The importance of wood fern rootstock as a winter food for the Gitksan is indicated by its adoption as a major crest by the house of *Woxsimlax̄haa* of the *Gisq̄aast* (Fireweed Phratry) from Kispiox. The crest is called *Wii Ax̄* ("giant wood fern rootstock"). It refers to a story about a giant wood fern root which was accidentally discovered near Kisgegas by a man after being mistaken for firewood. A large pile of wood had been gathered and burned all night. In the morning the giant *ax̄* was discovered in the ashes. (This may be a reference to the discovery of how to cook *Dryopteris* rootstocks.) The present holder of the crest is Alvin Weget of Kispiox village, who inherited the crest and a button blanket which displays the crest (Alvin Weget, personal communication to LMJG, 1988).

Photographs taken by Marius Barbeau (1929:86-87) show two totem poles from Kispiox village in the 1920s bearing the "mountain fern crest" (*Wii Ax̄*). The first (Fig. 5) shows a geometric pattern of diamonds purported to be the "mountain fern crest" (*wii ax̄*), probably the spiny wood fern. Modern residents of the village do not appear to recognize this crest. The second pole, still standing today (in a different location), stood beside the first, and figures the *Wii Ax̄* crest in more representational fashion: a series of upward pointing fingers in several tiers topped with four or five stylized fiddleheads (Fig. 6).

Boas (1932:227) reports a relevant traditional belief held by the Kwakiutl: "When fern roots (*Dryopteris spinulosa*, *tsa'k'ús*) are steamed in an oven, an immature girl, if possible the daughter of the woman who cooks the roots, must tramp on the mat to press the whole down firmly." In a previous description of pit-cooking the ferns (Boas 1921:521) he stated that the filled cooking-pit should be trampled by "a woman who has had just one husband, and whose husband is still alive, and who has never been a widow, and whose monthly period terminated at least eight days before." He also noted that all members of the household in which the fern rootstocks were being pit-cooked should abstain from sexual intercourse during the night.

CONCLUSIONS

Although several different botanical identifications have been published for the edible wood fern rootstock, used as a food and emergency ration by Native peoples in western North America from Washington to Alaska, evidence sug-



FIG. 5.—Pole from Kispiox (“Kispayaks”) Village, showing at the base a geometric pattern of diamonds purported to be the “mountain fern crest” (*Wii ax̄*), probably *Dryopteris expansa* rootstock (left). Modern residents of the village do not appear to recognize this crest. FIG. 6.—Pole from Kispiox Village, showing the *Wii Ax̄* crest in more representational fashion: a series of upward pointing fingers in several tiers topped with four or five stylized fiddleheads (right).

Figure 5 photo by C.M. Barbeau, taken in 1920.

Courtesy of National Museums of Canada, Canadian Museum of Civilization, Ottawa, Ontario; Neg. No. 49285.

Figure 6 photo by Wilson Duff, taken in 1952.

Courtesy of the Royal British Columbia Museum, Victoria, British Columbia, pn No. 7037.

gests that the major species involved was *Dryopteris expansa*, a member of the *Dryopteris austriaca* complex. Within this species, the largest specimens were preferred and selected. Other species with similar appearing rootstocks, including *D. carthusiana* and *D. filix-mas*, and *Polystichum munitum*, were also apparently eaten on occasion. Although *Athyrium filix-femina* has often been suggested as the edible wood fern, most knowledgeable Native elders who have examined its rootstock closely reject it as an edible type.

Present use of wood fern rootstocks as food is extremely low. In most cases, only Native elders in their sixties or older remember having eaten this food, or have themselves gathered and prepared it. A few elders are interested in obtaining and cooking it "for old time's sake," and to enjoy the remembered flavor. Everyone universally comments on the greater convenience and availability of substitute carbohydrate foods like potatoes and turnips. Some potential use for a survival food or an infrequently used cultural specialty food seems appropriate.

Because the distribution of the edible wood fern is scattered, and because harvesting the rootstock for food means destruction of the entire plant, conservation of wood fern populations should be a primary consideration in any program involving future food use of wood fern.

NOTES

¹J.P. Harrington's notes (ca. 1910) are at the Smithsonian Institution, Washington, D.C. (Reel 15, frame 0472). Ethnographer T.T. Waterman confirmed the same term for this fern about a decade later (Barbara Lane, personal communication to NJT, 1985).

²Four different unpublished manuscripts of Harlan I. Smith are cited. They contain unnumbered pages, many of which are duplicated under one or more different titles. Handwritten notes have been added to typed text with occasional dated entries. Comments on Pteridophyte data date mostly from 1920-1922. The original manuscripts are all held by the National Museum of Civilization in Ottawa, Ontario (formerly National Museum of Man), and are entitled: "The Material Culture of the Carrier Indians of British Columbia, Part 1. Introduction to Food Starvation;" "The Material Culture of the Carrier Indians of British Columbia, Part 2, Securing Food to Dwellings;" "The Uses of Plants by the Bella Coola Indians of British Columbia, Vol. 1;" and "The Uses of Plants by the Carrier Indians of British Columbia, Vol. 1." His Native consultants included Captain Schooner (Nuxalk, or Bella Coola speaker, born ca. 1848), Joshua Moody (Nuxalk speaker, born ca. 1868), Louie Hall, and "Pretty Charlie," (probably Ulkatcho Carrier speaker Charlie West). Voucher specimens made by Smith of the ferns mentioned in his notes are at the National Herbarium in Ottawa (CAN). They were examined by Adolf Ceska during the present research.

³The following unpublished notes on the Haida and Nuxalk made by Nancy J. Turner, and in her possession, are cited in the manuscript: Turner 1970 (Haida), Turner 1971 (Haida), Turner 1981 (Nuxalk), Turner 1983 (Nuxalk), Turner 1988 (Nuxalk).

⁴Harlan I. Smith's unpublished notes, ca. 1921: "Lady Fern, *Asplenium cyclosorum*" (collections made by Smith: 8a June 7, 1920 [CAN 525 607]; 8b June 22, 1920 [CAN 525 608]); both were confirmed by Adolf Ceska as *Athyrium filix-femina*.

- ⁵Harlan I. Smith's unpublished notes: "Shield Fern, *Aspidium spinulosum*" (collections made by Smith 7(54M) June 18, 1921 [CAN 525 615], and 7(77M) July 11, 1921 [CAN 525 616]. Both identified by Adolf Ceska as *Dryopteris expansa*.)
- ⁶Harlan I. Smith's unpublished notes: "*Aspidium filix-mas*" (Smith Coll. 7(55M), June 18, 1921 [CAN 539 343]; identified by Adolf Ceska as *Athyrium filix-femina*, but specimen is the top part of an old frond, easily mistaken for *Dryopteris filix-mas*—AC).
- ⁷This term, *salídana*, is sometimes applied as a general term for ferns in North Wakashan languages such as Kwakwala (Southern Kwakiutl) and Haisla, or to *Polystichum munitum* specifically (cf. Turner and Bell 1973; Lincoln and Rath 1986; Brian Compton, personal communication to NJT, 1989).
- ⁸Two ferns, one called *da sǔn a chǔn* and one, *ah, aǔ, ah chǔn*, or *aǔ chǔn*, are mentioned in Harlan I. Smith's unpublished Carrier notes. The former term, listed under "Lady Fern (*Asplenium cyclosorum* Rupr.)," has a hand-written notation: "Leaves coarse and less bifurcated than the shield fern." The latter, under "Shield Fern," states: ". . . has spores and is finer and more bifurcated than [*Asplenium*] . . . This Shield fern roots used for food found 20 miles away [in the Bella Coola Valley] . . . roots called *ah*. . . it always has little [hairs?; can't read handwriting] like where branchlets come off stem . . . there are none on [*da sǔn a chǔn*]." Smith noted that *ah chǔn* was the same as *squalum* in Bella Coola, but also reported that one of his Native consultants (H.I.S.) could not distinguish between the two types.
- ⁹Another aspect of the confusion is seen in Franz Boas's classic work, *The Ethnology of the Kwakiutl* (Boas 1921), where meticulously reported accounts are given in English and Kwakwala of the harvesting, preparation, and serving of Kwakiutl foods. Cultural features of at least three edible fern species are described, all called in the English version simply "fern-root:" bracken (*Pteridium aquilinum*)—*sāguma*; licorice fern (*Polypodium glycyrrhiza*)—*Āk!wa^eyē*; and wood fern (*Dryopteris expansa*, or "*D. spinulosa*")—*tsāk^eusē*. One must consult the Kwakwala text to learn which species is being discussed. In fact, in at least one case (Boas 1921: 526), the scientific identification for the fern being discussed, given as *Dryopteris spinulosa*, does not match the Kwakwala name used, *Āk!wa^eyē*, and the information given also matches *Polypodium*, since it refers to the "fern-root" being held in the mouth of a hunter to alleviate hunger and thirst, a common practice for this latter species.
- ¹⁰A small, related species of rocky areas, *P. imbricans* (D.C. Eaton) D.H. Wagner, sometimes included as a form of *P. munitum*, extends in our area only to the eastern part of Vancouver Island and the Sechelt Peninsula; its rootstock is very small, and its use as food is unlikely.
- ¹¹Another fern, whose fiddleheads were eaten by Native peoples of the Maritimes, *Matteucia struthiopteris* (L.) Tod. (ostrich fern), also occurs in some locations where edible wood fern rootstocks are used (i.e., Kispiox River and north of Kitimat) but its range is quite restricted, nor, to our knowledge, has it ever been cited in the ethnobotanical or ethnographic literature of western North America as having been eaten here.
- ¹²*Dryopteris fragrans* (L.) Schott. (fragrant shield fern or fragrant cliff fern) can be excluded from the species possibly used as food, because of its small size and its limited distribution on dry limestone cliffs in northern British Columbia and Alaska (cf. Scoggan 1978; Hultén 1968). *Dryopteris arguta* (Kaulf.) Watt (coastal shield fern) is likewise excluded

- because it is restricted to southeastern Vancouver Island (near Nanoose Bay) and the adjacent Gulf Islands (Straley et al. 1985), whereas the major reports of use of edible wood fern are outside of this range. *Dryopteris cristata* (L.) A. Gray is a relatively rare species of the British Columbia interior, and has not been collected at all along the coast (Straley et al. 1985).
- ¹³Some authors, including Walker (1961), questioned correctness of the name *D. carthusiana*, but we followed the nomenclature suggested by Heywood (1964) and generally accepted in the recent pteridological literature (Page 1982; Lellinger 1985).
- ¹⁴In a taped interview with Nancy J. Turner, 1971. The ferns being discussed included *Athyrium filix-femina*, "*Dryopteris austriaca* [*D. expansa*]," *Adiantum pedatum*, and *Blechnum spicant*, all of which George Young called, at times, *djagwal*. *D. expansa* was also called *snándjang*; *Pteridium aquilinum* he called *snándjang-xil*; and large specimens of *Athyrium filix-femina*, *Dryopteris expansa*, and *Polystichum munitum* were called *tságwel*, or *skyaw* (lit. "tail"), which he specified pertained to the larger, edible rootstocks. They are also sometimes called *tanskyaw* (lit. "black-bear's tail"). The smaller specimens of these species and *Blechnum spicant*, with rootstocks too small to eat, were sometimes called *snal-djat* (lit. "scabby-girl") (Florence Davidson and Willie Matthews, Masset speakers, in Nancy J. Turner unpublished notes, 1971).
- ¹⁵Margaret Siwallance used this term specifically to refer to the dead fronds of *Pteridium* (bracken fern), but recently she applied it to the dead fronds of any fern, or even dead leaves of any tree (Randy Bouchard, unpublished notes, 1974).
- ¹⁶Voucher specimens at Royal British Columbia Museum Herbarium: *Turner 1698—V 127,877* (*Athyrium filix-femina*) and *Turner 1699—V 127,878* (*Dryopteris expansa*).
- ¹⁷Voucher: *Turner 1592—V 88,796, 88,798—9*.
- ¹⁸The following unpublished notes made by Leslie M. J. Gottesfeld, and in her possession, are cited in the manuscript: Gottesfeld 1987, Gottesfeld 1988 (Gitksan).
- ¹⁹An additional fern to be found in the preferred habitat of *aḡ*, namely a mountain snow-bed or avalanche chute, is bracken (*Pteridium aquilinum*). This fern was distinguished by Jeff Harris Sr. and Billy Blackwater of Kispiox as being shoulder high and was called *haba ba'a*. Both *haba ba'a* and *dumtx* are said to have larger leaves than *aḡ* (Leslie M.J. Gottesfeld, unpublished notes, 1988). Voucher specimens of *aḡ* collected by Gottesfeld have not yet been accessioned at the Royal British Columbia Museum Herbarium (V), but all were identified or verified by Adolf Ceska, Jan. 30, 1989 as *D. expansa*: *TM 201, TM 202, Eth 25, Eth 29, Eth 30*.
- ²⁰This information was mentioned elsewhere by Gordon Robinson in a handwritten manuscript, transcribed from a recording of a speech by him on Haisla culture, on file at the Native Indian Teacher Education Program Library, University of British Columbia, Vancouver (no date given).
- ²¹Various other Haisla and Heiltsuk terms relating to the edible wood fern were recorded by Brian Compton from Gordon Robertson. These include terms meaning "soft end of edible fern root," "to eat edible fern root," "to go after edible fern root" (all Haisla), and "to eat fern roots" (Heiltsuk). There are also terms (Haisla, *k'ûlak*; Heiltsuk, *k'âlâx*, *k'lk'âx*) apparently referring to the fronds of wood fern, or "a long green fern species" (Lincoln and Rath 1986) which were used to cover salmon in a canoe to prevent them from drying out.

- ²²Randy Bouchard, unpublished notes, 1973, 1975, British Columbia Indian Language Project, Victoria, British Columbia.
- ²³Nancy J. Turner (1973; unpublished notes, 1983) reported that Margaret Siwallace stated that people wishing to lose weight ate wood fern rootstocks raw, but Harriet Kuhnlein, who also spoke to MS about this, felt that she meant the rootstocks took so much energy to find and dig out that by the time you got enough for a meal, you would lose weight. Kari (1987) (see section, *Survival and famine food*) implies that it is possible to *gain* weight from eating (cooked) fern rootstocks.
- ²⁴This dish is made from seal oil and commercial lards mixed with berries, a little sugar, boiled fish, and certain greens such as sour dock, horsetail, mare's tail, or wood fern. In the winter it is stored in the cold so that the oils congeal, and it is served in a solid state. It is a favorite dessert at Napaskiak, and an adult usually will consume two to three measuring cups full at a sitting (Oswalt 1957).
- ²⁵The beer, called *uh biva*, was made by mashing the rootstocks and cooking them for several hours in a gallon (5 l) of water. Hops were added, either before or after the rootstocks had finished cooking, and afterwards, a pound (0.5 kg) of sugar and a pound (0.5 kg) of mashed potatoes or raw cornmeal was added, followed by five more gallons (25 l) of water, and, finally, the yeast (this is one version of a rather variable recipe) (Kari 1987).
- ²⁶Swanton noted "evidently fragmentary" for this myth.
- ²⁷Hill-Tout (1905) identifies "*Tsúkwa*" only as "some kind of trailing plant or herb that grows on logs in the forest."

ACKNOWLEDGEMENTS

We would like to acknowledge the following aboriginal consultants for their contributions to this paper: Jeff Harris Sr., Solomon and Kathleen Marsden, Art Matthews Sr. and Kathleen Matthews, Alvin Weget, and Fern Stevens (Gitksan); Andrew George, Leonard George, Josephine Michell, Lizette Naziel, Kathryn Naziel, Sara Tait, Madeline Alfred, Alfred Joseph, and Elsie Tait (Wet'suwet'en); the late Dr. Margaret Siwallace and Felicity Walkus (Nuxalk); Gordon Robertson (Kitlope Haisla; interviewed by Brian Compton); Gordon and Phyllis Robinson and Lloyd Starr (Haisla); George Young (Haida); Mark Jacobs Jr. (Tlingit); Johnny Joe (Sechelt; interviewed by Randy Bouchard, 1978); Bill and Rose Mitchell, and Jeannie Dominick (Mainland Comox; interviewed by Randy Bouchard, 1975). Many others provided information through published sources, and are acknowledged by name in most of these. Native language translators included Doris Michell and Cecilia Lapalme (Wet'suwet'en) and Beverley Anderson and Barb Senott (Gitksan).

Samples for nutrient analyses were collected at Bella Coola by Sandy Burgess, Sarah Saunders, Dana Lepofsky, Aaron Hans, and David Hunt.

We are also grateful to the following people for their help in providing information and/or editorial advice: Randy Bouchard and Dorothy Kennedy of the British Columbia Indian Language Project; Brian Compton; Dr. Eugene Hunn; Dr. David French; Dr. Barbara Lane; Dr. M. Dale Kinkade; Robert D. Turner; Dr. Richard Hebda; Robert Tyhurst; Beverley Anderson; and Allen Gottesfeld. Financial support to LMJG for various parts of this research was provided by the Gitksan-Wet'suwet'en Education Society, the Gitksan-Wet'suwet'en Traditional Medicine Project, the Kyah Wiget Education Society, and the Secretary of State.

The National Museums of Canada, Canadian Museum of Civilization, Ottawa, Ontario, is acknowledged for permission to quote from Harlan Smith's unpublished notes (see Note 2 for details). The herbarium of the National Museums of Canada, Canadian Museum of Natural History, Ottawa (CAN), and Dr. K.M. Pryer and N.J. Shchepanek (Collections Manager), are acknowledged for the loan of Harlan Smith's voucher specimens of *Dryopteris* and other ferns. The staff of the University of Washington herbarium (WTU), and Leslie Kennes and Joan Kerik at the Royal British Columbia Museum's herbarium (V) are also acknowledged for their help.

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